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Block A, LS9

**The Plan:**

Our plan was to make ice cream with plastic bags. We put all of the ingredients into a 1 Quart Ziplock bag, and then put the small bag into a bigger bag filled with salt and ice. We shook the ice cream until it solidified. Our experiment was demonstrational and at the same time, controlled. This is because we tested whether whole milk, skim milk or soy milk is the best to make ice cream. We decided to perform this experiment because it would be fun, and at the same time, we would be able to learn more about the actual science inside the cold desert that we all love to eat.

**Materials:**

1 Quart Ziplock bag  
1 Gallon Ziplock bag  
1/2 cup milk (whole, skim, soy)  
1/2 cup whipping cream  
1/4 cup sugar  
1/4 teaspoon vanilla flavoring  
sodium chloride (salt)  
ice  
thermometer  
measuring cups (1, 1/2, 1/4)  
styrofoam cups  
plastic spoons

**The Results:**

We succeeded in making ice cream out of ice, salt, milk, sugar, vanilla, whipping cream and plastic bags. After we did so, we did a few additional experiments to see whether mixing crushed strawberries in with the other ingredients would make strawberry ice cream, and whether mixing cocoa in would make chocolate ice cream. We succeeded in making these two flavors also. The method we used, with plastic bags, was pretty efficient. Sometimes the bags leaked, which was a problem, but we were able to overcome this by putting another bag over the bag.

Below, in our daily journal, is a sequence of things that we did every class period with our ice cream:

December 1, 2008  
Whole Milk:  
-Temperature of ice (before we started): 2.5 degrees C  
-4 cups of ice used (2 cups, 1 cup after 6 minutes, another after 15 minutes)  
-Temperature of ice (after we finished): -4.5 degrees C  
Skim Milk:  
-Ice Cream hardened after 8 minutes.  
-3 cups of ice used (2 cups, another after 6 minutes)  
Soy Milk:  
-3 cups of ice used (2 cups, another after 6 minutes)  
-Ice cream thickened after 13 minutes, stopped at 15 minutes  
  
December 3, 2008 (Chocolate Ice Cream)  
All Milks:  
-2 tbsp. cocoa added  
-6/8 c salt in each plastic bag (double bagged all bags because they were leaking)  
-Whole milk took a really long time (maybe because we lost some ice-hole in ice cream bag)  
  
December 5, 2008 (Strawberry Ice Cream)  
Whole Milk:  
-1/2 cup strawberries in each bag  
-Ice cream done in 12 minutes  
-Strawberry worked the fastest

Figure This is what our chocolate ice cream looked like when we were almost finished making it.



In this picture, it can be somewhat seen that the ice cream isn’t completely solidified. However it is also not completely a liquid. Many of the ingredients (as you will read below) played a part in helping the ice cream solidify.

Figure 1 This is what our chocolate ice cream looked like when we were almost done making it.

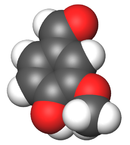
**What I learned:**

In performing this experiment, I was able to learn and see for myself how adding salt to the ice actually lowered the temperature of the ice, so that the ice cream would solidify faster. I improved my understanding of the atomic theory of matter by doing this experiment. I learned about all of the ingredients we used, and through doing so, I was able to learn about what they were made of, and how they reacted with each other. Overall I was able to learn about what makes up ice cream.

One of the main things I learned through doing this experiment was that it’s possible to make ice cream using normal, household materials! Before we did the experiment, I was a bit skeptical as to how the ice cream would turn out. I didn’t expect it to be good, but it was better than most ice cream I’ve tasted before. Next time, if I do this experiment again, I would probably use thicker bags, or something else to hold the ingredients since the bags we used constantly leaked. This was a minor problem, but still a problem that could have been overcome. The incidences can be used as a lesson for future experiments. Next time, I would probably also take more measurements of the temperature of the water/ice, ice cream, etc., and just more measurements in general. Taking more measurements, like the temperature of the ice water before and after the experiment, for example, could have helped me have a deeper understanding of how the salt itself actually affected the making of the ice cream.

Here’s what I learned about the different ingredients in ice cream:

**Vanilla:**

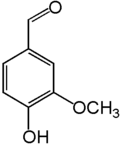
[](http://en.wikipedia.org/wiki/File:Vanillin-3d.png)

In this diagram, the oxygen atoms are red, the carbon atoms are grey and the hydrogen atoms are white. This actually isn’t Vanilla itself, but it’s the organic compound, Vanillin, that can be found inside of Vanilla.

(*http://en.wikipedia.org/wiki/Vanillin)*

Figure This is a molecule of Vanilla. The diagram represents its chemical formula, C8H8O3.

This is a space fill model.

[](http://en.wikipedia.org/wiki/File:Vanillin.png)

The chemical formula for Vanillin is C8H8O3. In this diagram, you might notice that there are some atoms missing. For example, all the oxygen atoms are there, but 4 hydrogen and 7 carbon atoms are missing. In actuality, these atoms are in the diagram. In the diagram that I drew (based on the original diagram), I added in the “missing” atoms where they’re supposed to be.

Figure This is another way to represent a molecule of Vanillin.

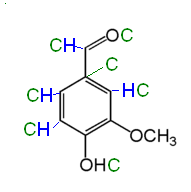
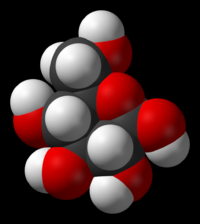


Figure In this diagram, I filled in where the missing atoms are supposed to go. Now the diagram corresponds with the chemical formula.

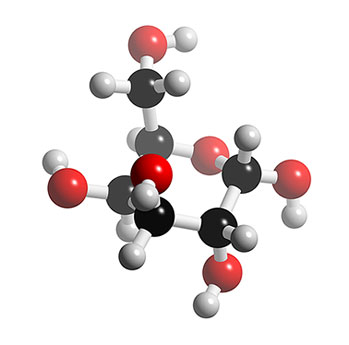
**Milk:**

A large portion of milk is made out of Lactose. Lactose gives milk its sweet taste, and it can be broken down into two simple sugars: Glucose and Galactose.



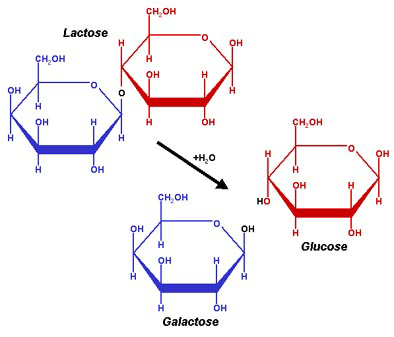
*http://upload.wikimedia.org/wikipedia/commons/7/72/Beta-D-glucose-3D-vdW.png*

Figure This is a space fill diagram of Glucose. Glucose has the chemical formula [C](http://en.wikipedia.org/wiki/Carbon)6[H](http://en.wikipedia.org/wiki/Hydrogen)12[O](http://en.wikipedia.org/wiki/Oxygen)6. The Carbon atoms are grey, the Hydrogen atoms are white and the oxygen atoms are red. If this is the case then it can be clearly seen that there are 3 Hydrogen atoms missing from the diagram.



*http://www.3dchem.com/molecules.asp?ID=419*

Figure This is a diagram of Galactose. Galactose has the chemical formula C6H12O6. The oxygen atoms are red, the carbon atoms are black and the hydrogen atoms are grey.



This diagram represents this chemical equation:

C12H22O11—(H2O)🡪 C6H12O6+C6H12O6

Being able to write chemical equations is also something that I learned, and couldn’t do before.

Figure This is a diagram of Lactose (a sugar found in milk) being broken down into glucose (a type of "corn sugar" less sweet than glucose) and galactose (a less sweet type of sugar). Lactose has the chemical formula C12H22O11, Glucose has the chemical formula [C](http://en.wikipedia.org/wiki/Carbon)6[H](http://en.wikipedia.org/wiki/Hydrogen)12[O](http://en.wikipedia.org/wiki/Oxygen)6 , and Galactose has the chemical formula C6H12O6.

**Salt:**

Another name for table salt, the kind that we used, is Sodium Chloride. It’s a chemical compound with the chemical formula NaCl. The sodium chloride forms crystals, which is the salt that we used.

Salt lowers the temperature of water’s freezing point. The salinity (S), or saltiness, of water is measured as grams salt per kilogram (1000g) water, and the freezing temperatures are as follows.

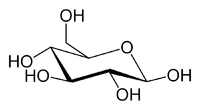
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*(*[*http://en.wikipedia.org/wiki/Sodium\_chloride*](http://en.wikipedia.org/wiki/Sodium_chloride)*)*

As this table shows, the salt can lower the freezing point of water by quite a bit (up to 2 degrees Celsius). This relates to the experiment because we could have calculated how much salt to put in based on how low we wanted the temperature of the water to be, using this information.

**Sugar:**

Another name for sugar is Glucose. Besides the space fill diagram of Glucose in Figure 5, here is another way to represent it.



*http://upload.wikimedia.org/wikipedia/commons/e/e9/Glucose-2D-skeletal.png*

Figure This diagram of Glucose is very different from the one shown in Figure 5. The chemical formula is the same (C6H12O6), but as you can see, there are many atoms missing. Seven Hydrogen atoms are missing and all Carbon atoms are missing.

**Whipping Cream:**

In the ice cream, whipping cream is used to make the ice cream more solid. At first, when put in, the whipping cream is a thick, creamy liquid. However if it’s whipped and air gets mixed in with it, it turns to whipped cream (slightly more solid). (*http://en.wikipedia.org/wiki/Cream*). Therefore, if air is forced into the molecules of whipping cream, then the cream turns to whipped cream.

Whipping cream is made up of 30 to 36% fat. ([*http://en.wikipedia.org/wiki/Cream*](http://en.wikipedia.org/wiki/Cream)). All fats consist of fatty acids (chains of carbon and hydrogen atoms). ([*http://en.wikipedia.org/wiki/Fat*](http://en.wikipedia.org/wiki/Fat)). Eicosapentaenoic acid is a type of fatty acid. This acid has the chemical formula C20H30O2.

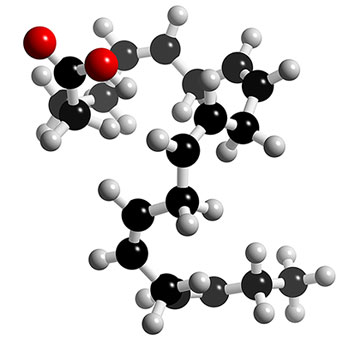


Figure This diagram represents a strand of Eicosapentaenoic acid- a type of fatty acid. Fatty acids make up most fats. With the chemical formula C20H30O2, the oxygen atoms are red, the carbon atoms are black and the hydrogen atoms are grey.

**Conclusion:**

As the above information demonstrates, I was able to learn a lot through performing this experiment. Before, I never really thought about how salt could be so important in the making of ice cream (in this experiment). I always knew that salt could melt things (when salt gets put on icy roads), but I never actually thought, or knew, about how this worked. I now know that salt actually lowers the temperature of the ice, helping the ice cream solidify faster. I also didn’t think about the importance of every single ingredient in making ice cream. Now I know that every ingredient plays a specific and important role in the ice cream.

When doing an experiment in the future, or even doing the same experiment again, I think one main thing I’d do differently is to do a bit of research before doing the actual experiment. If I had done all of the above research before the experiment, I think the experiment could have been changed to produce an even better result. For example, if I had known how much exactly the salt could lower the freezing temperature of the water, I would have put in more salt to make the water colder, so that the ice cream would solidify faster.

To conclude, this experiment opened my mind as to how something so simple and commonly seen (ice cream) could be, on the other hand, so complicated. Even though it was actually a pretty simple experiment, it was successful and I’m glad we did it.